Workshop Regarding Regulatory Fuels Activities

April 24, 2002

California Environmental Protection Agency

Air Resources Board

Agenda

- Introductions
- Evaluation of Diesel Engine Lubrication Oils and Diesel Fuel Lubrication Properties
- ARB's actions in response to Executive Order D-52-02
- Review of De Minimis Levels for MTBE and Other Oxygenates in CaRFG3
- Other Miscellaneous Changes for CaRFG3
- Presentations by Others
- Open Discussion
- Closing Remarks

Evaluation of Diesel Engine Lubrication Oils and Diesel Fuel Lubrication Properties

Sulfur Levels in Lubricating Oils

- Sulfur content of diesel engine lubricating oils range from 2,500 to 8,000 ppm
- Sulfur contributions to finished lubricating oils
  - Base stock: from essentially sulfur free up to 4,000 ppm
  - Additives: typically 2,500 ppm to 3,000 ppm sulfur
- Worst case estimate for sulfur contribution of lubricating oils to exhaust
  - 7 ppm maximum equivalent fuel sulfur contribution based on:
    - 8,000 ppm sulfur content in lubricating oil
    - nominal oil usage of 1 quart every 2,000 miles
    - heavy duty diesel engine fuel usage of 6 miles per gallon

APBF-DEC Lubricants Work Group Phase 1 Testing

- Objective
  - Determine impact of lubricant properties and composition on engine-out/catalyst-in emissions
    - Evaluate matrix of additives with four different base stocks
    - Test engine: Navistar T444E
- Schedule:
  - Testing expected to be completed by end of April or start of May 2002
  - Data reduction and reporting to be completed by June 2002
  - Preliminary results have been inconclusive

APBF-DEC Lubricants Work Group Phase 2 Testing

- Objective
  - Evaluate impact of lubricant formulations on performance and durability of advanced diesel emission control systems
  - Initial focus on PM aftertreatment
  - NOx aftertreatment also to be addressed
- Schedule:
  - Test protocol development and evaluation to be initiated May 2002
  - Evaluation of test oils to commence ~ August 2002
  - Testing to be complete ~ August 2003
  - Data evaluation and reporting to be complete December 2003

DASL/N-TCD Consortium

- Southwest Research Institute announced start of private consortium, Diesel Aftertreatment Sensitivity to Lubricants (DASL) / Non-Thermal Catalyst Deactivation (N-TCD) March 21, 2002
- Five industry members
- DASL effort:
  - Cause and effect study to expose diesel emission control systems to oil combustion by-products
  - Measure deactivation of emissions-control systems

Related ASTM Activity

- New API Service Category CI-4 to begin licensing in September 2002
  - For severe duty diesel engine service
  - Specifically formulated to sustain engine durability where exhaust gas recirculation (EGR) is used
- PC-10 expected to be initiated at the June 2002 ASTM meeting in Montreal
  - For use with aftertreatment technology
  - Lower sulfur, phosphorous, and sulfated ash
  - Engine durability issues to be addressed

Regulatory Development Process

- Consider possible diesel engine lubricating oil specifications
- Expected scope: limit sulfur/ash content of lubricating oil base stock with recognition of appropriate levels to ensure engine protection
- Consider limiting sulfur/ash in additives, if necessary

Regulatory Development Process (cont.)

- Interim recommendations
  - Address early introduction of aftertreatment technology
  - Provide guidance to fleet operators on the use of existing engine oils with aftertreatment technology
  - Listing of engine oils by sulfur/ash content
  - Time frame: early 2003

Regulatory Development Process (cont.)

- Formal specifications
  - Support 2007 exhaust emissions standards
  - Recognize industry voluntary specifications
  - Consider results from the APBF-DEC testing
  - Time frame: Mid 2004

Regulatory Development Process (cont.)

- Gather information from industry via survey and meetings
  - Establish engine oil manufacturer contact list
  - Lubricating oil manufacturer survey and meetings
    - Sulfur/ash content of lubricating oils being sold in California
      - Base oil
      - Individual additives
    - Beneficial properties of sulfur/ash
    - Sulfur/ash alternatives
  - Engine manufacturer meetings
    - Engine lubricating oil requirements
    - Fuel and oil consumption rates by engine classification

Regulatory Development Process (cont.)

Schedule

- Industry meetings — on going
- Conduct survey — May/June 2002
- Follow APBF-DEC testing — on going
- Hold workshop on interim recommendations — August 2002
- Board consideration of interim recommendations — early 2003

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- Board consideration of formal specifications — mid 2004

ASTM Moving Forward with Lubricity Standard

- ASTM lubricity standard proposal being prepared to send out for balloting at subcommittee level in approximately two weeks
  - Sets minimum lubricity levels for unadditized fuel
    - Scuffing Load Ball on Cylinder Lubricity Evaluator (SLBOCL)
    - High Frequency Reciprocating Rig (HFRR)
  - Not applicable to additized fuel

ASTM Moving Forward with Lubricity Standard (cont.)

- Parallel efforts continuing:
  - Modifications of tests for determining lubricity of additized fuels being investigated
    - Ball on Three Discs (BOTD)
    - High Frequency Reciprocating Rig (HFRR)
  - ASTM Diesel Fuel Lubricity Task Force round-robin pump stand testing on-going
- ASTM standard will be updated as appropriate

ARB's Actions in Response to Executive Order D-52-02

Governor's Executive Order D-52-02

- Issued by Governor Davis on March 14, 2002
- Orders that "by July 31, 2002, the board shall take the necessary actions to postpone for one year the prohibitions of the use of MTBE and other specified oxygenates in California gasoline, and the related requirements for California Phase 3 reformulated gasoline."

Proposed Amendments to CaRFG3 Regulations for July Board Hearing

- Postpone prohibition on the use of MTBE and oxygenates other than ethanol in CaRFG3 gasoline
- Postpone imposition of CaRFG3 standards
- Postpone imposition of the denatured ethanol specifications
- Revise schedule for reducing de minimis MTBE levels
- Other miscellaneous changes

Proposed Amendments to CaRFG3 Regulations for November Board Hearing

- Revise schedule for reducing de minimis MTBE levels
- Set de minimis levels for total oxygen provided by oxygenates other than MTBE and ethanol
- Other miscellaneous changes

Review of MTBE De Minimis Levels and Other Changes Proposed for November Board Hearing

Review of De Minimis Levels for MTBE and Other Oxygenates in CaRFG3

- Revise dates of current schedule to be consistent with postponement of MTBE phase out
- Postponed proposed amendment to reduce de minimis levels in four steps instead of three
- Plan to propose this amendment to the Board in November

CaRFG3 Basic Prohibition of MTBE after July Board Hearing

- Starting December 31, ***2003***, no California gasoline produced with the use of MTBE.
- Timetable for reducing residual MTBE levels
  - Limits that must not be exceeded
    - Starting December 31, ***2003***: 0.3 volume %
    - Starting December 31, ***2004***: 0.15 volume %
    - Starting December 31, ***2005***: 0.05 volume %

Evaluation of Oxygenate Prohibitions

- Board Resolution 99-39 directed the Executive Officer to further evaluate the practicality of allowable MTBE residual limits for CaRFG3, and return with recommendations.

- Evaluate de minimis MTBE levels
  - Residual MTBE in retail non-MTBE gasoline
  - MTBE in current blendstocks

Survey of Retail Stations

- Objectives
  - Determine residual MTBE in non-MTBE gasoline (i.e., MTBE level does not exceed 0.6 volume %)
  - Determine levels of oxygenates other than MTBE and ethanol
- Retail Stations
  - Nine in Lake Tahoe area
    - CaRFG with ethanol
    - Non-oxygenated CaRFG
  - Twelve in Bay Area
    - Non-oxygenated gasoline
    - MTBE gasoline
    - No ethanol containing gasoline

Results of Evaluation

- Retail gasoline
  - Low levels of MTBE in gasoline from Lake Tahoe area and Bay Area
  - More time might be needed to flush MTBE out of the distribution system
  - TAME was the only oxygenate detected other than MTBE and ethanol
    - detected in Bay Area
    - gasolines contained both MTBE and TAME
    - TAME provided 30 to 35 % of total oxygen

Amendments of MTBE Prohibitions to be Proposed to Board in November

- Reduce de minimis levels in four steps instead of three and delay implementation dates for current levels
  - Initial 6-month phase with de minimis limit at 0.60 vol.% (same as labeling requirement for non-MTBE gasoline)
  - The de minimis level of 0.3 volume % would be effective starting July 1, 2004 instead of Dec. 31, 2003
  - Allow 18 months instead of 12 months to reduce level from 0.3 to 0.15 vol.%
  - Final prohibition level of 0.05 vol.% effective 12 months later

New Draft Definition

- "Produced with the use of" a particular oxygenate means manufactured in part by adding the oxygenate to the fuel blend, or by using a blendstock to which the oxygenate has been added. Excluding:
  - Use of a blendstock in which limited amounts of the oxygenate have been generated as an unavoidable byproduct in the production of the blendstock; and
  - Incidental commingling of gasoline or gasoline blendstock with another product containing the oxygenate during transfer operations or changes in service of storage equipment.

MTBE De Minimis Specifications for CaRFG3 to be Proposed in July and November

Allowable Residual MTBE Levels (volume %)	Date to be proposed to Board	
	July, '02	November, '02
0.60	--	Dec. 31, 2003
0.30	Dec. 31, 2003	July 1, 2004
0.15	Dec. 31, 2004	Dec. 31, 2005
0.05	Dec. 31, 2005	Dec. 31, 2006

Other Oxygenate Prohibitions

- De minimis levels for oxygenates other than ethanol and MTBE
  - Oxygenates in current blendstocks
  - Future blendstocks as sources of oxygenates
    - Akylate produced in converted MTBE plants
    - Alcohols and ethers as byproducts
    - Alcohols and ethers as transportation contaminants

CaRFG3 Basic Prohibition of Oxygenates Other Than MTBE and Ethanol

- Starting December 31, ***2003***, ethanol will be the only approved oxygenate for use in CaRFG3
- The prohibition applies unless:
  - Multimedia evaluation of oxygenate use, and
  - Approved by California Environmental Policy Council
- CaRFG3 did not set de minimis levels for oxygenates not approved by California Environmental Policy Council

Possible Amendments of Prohibitions for Oxygenates other than MTBE and Ethanol

- Set limit on total oxygen content in finished gasoline
- Oxygenates are defined by the U.S. EPA registration of oxygenates and Sub-Sim provisions.
- Use ASTM D 4815-99 to determine contribution of non-MTBE/ethanol oxygenates.
- Oxygen content will be calculated from sum of oxygenates other than MTBE or ethanol.
- Non-detects will be counted as zero.

Oxygenates Other than MTBE and Ethanol

Methanol
Isopropanol
n-propanol
n-Butanol
iso-Butanol
sec-Butanol
tert-Butanol
tert-pentanol (tert-amylalcohol)
Ethyl tert-butylether (ETBE)
Diisopropylether (DIPE)
Tert-amylmethylether (TAME)

Possible Amendments of Prohibitions of Oxygenates other than MTBE and Ethanol (cont.)

- Reduce residual oxygen levels in two stages
  - Initial 6-month phase with de minimis level of 0.1 wt.% for the total oxygen concentration of prohibited oxygenates. (this oxygen level is equivalent to the initial MTBE de minimis level)
  - Starting July 1, 2004, the total oxygen concentration from all of the prohibited oxygenates cannot exceed 0.06 percent by weight.

Other Miscellaneous Proposed Changes

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- **Section 2262.4.**(b)(2) **Regulatory control periods for production and import facilities.**
  - (D) *May 1 through September 30:*
    - North Coast Air Basin (Added)
    - *North Central Coast Air Basin (Removed)*
  - (E) *May 1 through October 31:*
    - North Central Coast Air Basin (Added)
    - *North Coast Air Basin (Remove)*

Other Miscellaneous Proposed Changes (cont.)

- Ethanol Content of Enforcement Handblends
  - Use 5.7%, 7.7%, or 10.0% for standard oxygen ranges
  - For all other ranges
    - %EtOH = 620 / ((218.8/%Oxy)-0.40), Where %Oxy is the midpoint of the specified oxygen range for the final blend

Presentations by Others

Open Discussion

Closing Remarks